MERCER UNIVERSITY
STEM EDUCATION INNOVATION LAB

Connecting AgSTEM to AKS
Mini-Lesson
Asynchronous 1

*****Before meeting as a group, spend 15-20 minutes individually looking over the assignment and writing down beginning ideas. During your individual time, focus on your grade level so that you are the expert when you come together with your group.**

| | K | 1st | 2nd | 3rd | 4th | 5th |
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| **AKS** | AKS 1. obtain, evaluate, and communicate information to describe patterns of what plants and animals need to survive | 1. obtain, evaluate, and communicate information about the basic needs of plants and animals | 3. obtain, evaluate, and communicate information about how plants and animals cause changes to the environment | 2. obtain, evaluate, and communicate information about the physical attributes of rocks, minerals, and soils | 4. obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an ecosystem | 6. obtain, evaluate, and communicate information to group organisms using scientific classification procedures |

As a team, review the vertical curriculum map above. Use the map to complete the following questions and tasks.

1) The verbs **obtain, evaluate,** and **compare** are used in the AKS for all six grade levels.
    a) What does each verb mean in terms of what students should be able to do?

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations as well as orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.

**Obtain:** Obtain means to gather information. Students can develop and use models to gather information. Students can ask questions as part of learning the science and define problems which can be both scientific and engineering related. Students can also plan and carry out an investigation in order to gather information. Finally students can use mathematics and computational thinking in order to obtain information.

**Evaluate:** Evaluate means to evaluate information. Students can develop and use models to predict and provide evidence of their scientific thinking. Students can engage in an argument from evidence. Students can also construct explanations with their scientific thinking and design solutions to their problem by using engineering practices. Students can also evaluate by analyzing and Interpreting data they have collected. Finally students can use mathematics and computational thinking to evaluate a problem.

**Communicate:** Communicate means to communicate information that was obtained and evaluated. Students can develop and use models to communicate. Students can engage in an argument from evidence either written or oral. Students can construct explanations of scientific thinking and design solutions to a scientific problem. Finally students can use mathematics and computational thinking to communicate results or data collected.

b) What SKILLS do students need to be able to have to be able to “obtain” information, “evaluate” information, and “communicate” information?

Based on the GCPS Science and Engineering Practices Implementation Rubric the students are categorized into 3 categories- emerging, evolving and engaging to assess their ability to obtain, evaluate and communicate. .

Emerging requires the following student actions: Do not read text for scientific information;
Read text to obtain scientific information, but do not evaluate or explain this information;
Do not compare or combine information from multiple texts considering the strengths of the information and sources.

Evolving requires the following student actions: Reads and evaluates text to obtain scientific information, but do not compare or combine information from multiple texts considering the strengths of the information and sources. Leverages two or fewer science and engineering practices in the gathering, evaluation, and communication of the data, evidence or information

Engaging requires the following student actions: Read and evaluate text to obtain scientific information; and is able to compare and contrast information from multiple grade-appropriate texts; Communicates in a way that is clear and coherent, and in which the development, organization and style are appropriate to the task, purpose and audience. Communicates scientific information both orally with peers and also in written formats.Leverages multiple science and engineering processes through the process of gathering, evaluating and communicating data, evidence or information

c) How do these verbs differ between grade levels? For example, what does communicate look like for a Kindergartner vs a 5th grader?

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. Upon entering third grade, students should be able to: Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s). Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea. Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim. Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.
Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. Upon entering middle school, students should be able to: Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.

2) What similarities do you see between the AKS across grade levels?

The similarities that I see between the AKS across the grade levels is the continuity of obtain, evaluate, and communicate information. Even though that may look different across the grade levels, the skill will build from teacher driven to student driven from kindergarten to fifth grade. Also the three verbs obtain, evaluate, and communicate information is tied to Life Science content and the vertical progression from kindergarten through fifth grade. These three verbs are consistently embedded in our AKS across

Physical Science and Earth Science topics throughout the year. Students need to develop these skills in order to be effective in careers that may involve working with peers.

3) Thinking about how the AKS are designed to build on each other, do you notice any gaps between grade levels where students may need further instruction to be able to master the AKS?

The only gap I noticed between grade levels where students may need further instruction is between 2nd and 3rd grade. Kindergarten teaches: **4. obtain, evaluate, and communicate information to describe the physical attributes of Earth materials (soil, rocks, water, and air) (GSE SKE2a)** 4a. ask and answer questions using text/media and observation to identify and describe Earth materials and record the physical attributes, such as texture and color (i.e., soil, rocks, water, and air) (GSE SKE2a) 4b. collaboratively construct an argument to classify soil and rocks based on their physical attributes (e.g. size, weight, texture and color.) (GSE SKE2b) then it is not revisited until 3rd grade. That is a very long stretch of time between the Kindergarten AKS and the 3rd grade AKS. Therefore if a student missed that concept being taught in kindergarten or has forgotten that introduction there may be a gap in instruction where the teacher may have to support with more background knowledge or hands on experiences to support instruction. The 5th grade AKS is new learning for students. From Kindergarten to Fifth grade students are exposed to their plant and animal basic needs, how plants and animals impact the environment, and the flow of energy within an ecosystem but the concept of grouping organisms and classifying them is new learning. There is a great bridge built and spans from Kindergarten to Fifth grade that will hopefully connect the concepts they have been taught over the years to support them with the background knowledge to learn the new concept in Fifth grade.

4) Rewrite the standards in “kid-friendly” language. Write them as “I can” statements that you may use in your classroom.

Provide an example:

| | K | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|---|
| **AKS** | 1. obtain, evaluate, and communicate information to describe patterns of what plants and animals | 1. obtain, evaluate, and communicate information about the basic needs of plants and animals | 3. obtain, evaluate, and communicate information about how plants and animals cause changes to the environment | 2. obtain, evaluate, and communicate information about the physical attributes of rocks, minerals, and soils | 4. obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an | 6. obtain, evaluate, and communicate information to group organisms using scientific classification procedures |

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| | need to survive | | | | ecosystem | |
| **Learning Target(s)** | **Knowledge Targets:**<br>• I can identify the basic needs of plants.<br>• I can identify the basic needs of animals.<br><br>**Reasoning Targets:**<br>• I can compare the basic needs of plants and animals.<br>• I can contrast the basic needs of plants and animals.<br>• I can generate questions to compare and contrast the basic needs of plants and animals. | **Knowledge Targets:**<br>• I can identify the basic needs of plants.<br>• I can identify the basic needs of animals.<br><br>**Reasoning Targets:**<br>• I can compare the basic needs of plants and animals.<br>• I can contrast the basic needs of plants and animals.<br>• I can ask questions to compare and contrast the basic needs of plants and animals. | **Knowledge Targets**:<br>• I can ask questions and gather information about major changes to the environment in our community due to plants and animals.<br>• I can identify how plants and animals cause changes to the environment in our community.<br><br>**Reasoning Target:**<br>• I can explain the cause of changes to the environment in my community due to plants and animals.<br><br>**Product Target:**<br>• I can construct a written explanation of the causes of change to the environment due to plants and animals in our community. | **Knowledge Targets:**<br>• I can identify a rock based on its physical attributes.<br>• I can identify a mineral based on its physical attributes.<br>**Reasoning Targets:**<br>• I can explain the difference between rocks and minerals.<br>• I can generate questions to differentiate between rocks and minerals.<br><br>**Knowledge Targets**<br>• I can identify the physical attributes of rocks.<br>• I can identify the physical attributes of minerals.<br><br>**Reasoning Targets**<br>• I can generate questions to classify rocks by their physical attributes. | **Knowledge Targets:**<br>• I can identify and explain the roles of producers, consumers, and decomposers in a community.<br>• I can identify a food chain.<br>• I can identify a food web.<br>• I can identify the producers, consumers, and decomposers in a food chain and food web.<br>• I can identify the flow of energy through a food web and food chain.<br><br>**Reasoning Targets:**<br>• I can explain the roles of producers, consumers, and | **Knowledge Targets:**<br>• I can identify animals that are vertebrates and animals that are invertebrates.<br>• I can identify vertebrates as either fish, amphibians, reptiles, birds, or mammals.<br>• I can identify plants that are vascular and plants that are nonvascular.<br>• I can identify vascular plants as either seed producers or non-seed producers.<br><br>**Reasoning Targets**:<br>• I can differentiate vertebrates from invertebrates.<br>• I can differentiate vertebrates into fish, amphibians, reptiles, birds or mammals. |

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| | | | | • I can generate questions to classify minerals by their physical attributes.<br>• I can analyze data to classify rocks and minerals by their physical attributes.<br><br>**Performance Targets**<br>• I can use simple tests to identify the color, texture, luster, and hardness of rocks and minerals. | decomposers in a community.<br><br>• I can explain how energy flows in a food chain.<br>• I can explain how energy flows in a food web.<br><br>**Product Targets:**<br><br>• I can develop a model that describes the roles of organisms in a community.<br><br>• I can develop a model to show the flow of energy in a food chain.<br>• I can develop a model to show the flow of energy in a food web. | • I can differentiate vascular from nonvascular plants.<br>• I can differentiate vascular plants into seed producers and non-seed producers.<br><br>**Product Targets:**<br>• I can develop a model to show how animals can be sorted as either vertebrates or invertebrates.<br>• I can develop a model to show how vertebrates can be sorted into groups.<br>• I can develop a model to show how plants can be sorted as either vascular or nonvascular.<br>• I can develop a model to show how vascular plants can be sorted as either seed producers or non-seed producers. |

5) Now that we know what students are supposed to master, you will be working with your team to brainstorm some lesson ideas connecting AgSTEM to the AKS.

***First, here is an example of how lessons can be built on one another vertically.***

- ALL GRADE LEVELS: Students will go visit the aquaponics system. Students will bring a notebook and a writing utensil to record their observations that they make about the system. Teachers should have clear expectations for what students should be looking for and recording.
    - K: Color and size of fish and plants
    - 1st & 2nd: The environment of the aquarium, the environment of the plants, the environment of the classroom
    - 3rd: Specific physical attributes of the plant section of the system
    - 4th: The environment, the connection between the aquarium and the plants
    - 5th: The organisms within the system
- ALL GRADE LEVELS: Students should return to their classrooms where they will work within small groups to discuss their observations.
- Grade appropriately: Students should be asked to report on their findings. For example, in Kindergarten students may be asked to draw plants and animals in groups based on similarities whereas in 4th grade students may be asked to create a flowchart based on their findings.
- ALL GRADE LEVELS: Students should work together to present their findings. This can be done in class presentations, a written paper, or group project, grade appropriately

Now, using the chart below (copy & paste your learning targets from #4 into this chart), brainstorm lesson topic ideas for each grade level.

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| **Learning Target(s)** | **Knowledge Targets:**<br><br>• I can identify the basic needs of plants.<br>• I can identify the basic needs of animals.<br><br>**Reasoning Targets:**<br>• I can compare the basic needs of plants and animals.<br>• I can contrast the basic needs of plants and animals.<br>• I can generate questions to compare and contrast the basic needs of plants and animals. | **Knowledge Targets:**<br><br>• I can identify the basic needs of plants.<br>• I can identify the basic needs of animals.<br><br>**Reasoning Targets:**<br>• I can compare the basic needs of plants and animals.<br>• I can contrast the basic needs of plants and animals.<br>• I can ask questions to compare and contrast the needs of plants and animals. | **Knowledge Targets**:<br><br>• I can ask questions and gather information about major changes to the environment in our community due to plants and animals.<br>• I can identify how plants and animals cause changes to the environment in our community.<br><br>**Reasoning Target:**<br>• I can explain the cause of changes to the environment in my community due to plants and animals.<br><br>**Product Target:**<br>• I can construct a written explanation of the causes of change to the environment due to plants and animals in our community. | **Knowledge Targets:**<br><br>• I can identify a rock based on its physical attributes.<br>• I can identify a mineral based on its physical attributes.<br>• I can identify the physical attributes of rocks.<br>• I can identify the physical attributes of minerals.<br>•<br><br>**Reasoning Targets**<br>• I can explain the difference between rocks and minerals.<br>• I can generate questions to differentiate between rocks and minerals<br><br>• I can generate questions to classify rocks by their physical attributes.<br>• I can generate questions to classify minerals by their physical attributes. | **Knowledge Targets:**<br><br>• I can identify and explain the roles of producers, consumers, and decomposers in a community.<br>• I can identify a food chain.<br>• I can identify a food web.<br>• I can identify the producers, consumers, and decomposers in a food chain and food web.<br>• I can identify the flow of energy through a food web and food chain.<br><br>**Reasoning Targets:**<br>• I can explain the roles of producers, consumers, and decomposers in a community. | **Knowledge Targets:**<br><br>• I can identify animals that are vertebrates and animals that are invertebrates.<br>• I can identify vertebrates as either fish, amphibians, reptiles, birds, or mammals.<br>• I can identify plants that are vascular and plants that are nonvascular.<br>• I can identify vascular plants as either seed producers or non-seed producers.<br><br>**Reasoning Targets**:<br>• I can differentiate vertebrates from invertebrates.<br>• I can differentiate vertebrates into fish, amphibians, reptiles, birds or mammals.<br>• I can differentiate vascular from |
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| | | | | • I can analyze data to classify rocks and minerals by their physical attributes.<br><br>**Performance Targets**<br>• I can use simple tests to identify the color, texture, luster, and hardness of rocks and minerals. | • I can explain how energy flows in a food chain.<br>• I can explain how energy flows in a food web.<br><br>**Product Targets:**<br>• I can develop a model that describes the roles of organisms in a community.<br>• I can develop a model to show the flow of energy in a food chain.<br>• I can develop a model to show the flow of energy in a food web. | nonvascular plants.<br>• I can differentiate vascular plants into seed producers and non-seed producers.<br><br>**Product Targets:**<br>• I can develop a model to show how animals can be sorted as either vertebrates or invertebrates.<br>• I can develop a model to show how vertebrates can be sorted into groups.<br>• I can develop a model to show how plants can be sorted as either vascular or nonvascular.<br>• I can develop a model to show how vascular plants can be sorted as either seed producers or non-seed producers. |
| **Lesson Ideas 1-3 per grade** | **Lesson 1:** Students will visit the aquaponics | **Lesson 1:** Students will make | **Lesson 1:** Students visit and observe the | **Lesson 1:** Students pretend to be a geologist | **Lesson 1:** Have students design a model of | **Lesson 1:** After making observations, |

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| **level**<br>(This can be a bulleted list) | lab. After observing the system the students will generate observations as a large group. Teacher will record.<br><br>**Lesson 2:**<br>Students will return to the aquaponics lab with their journals. They will be instructed to observe and record what they notice. They will break into small groups to share records and notice how their observations are the same and different.<br><br>**Lesson 3:**<br>Students will be broken into 4 groups and each group will be given a question to answer about the aquaponics system. (How many fish? What is growing?, What are the plants growing in? Where are the plants getting their food? etc.) After observing the | a venn diagram to compare and contrast what animals and plants need to survive based on their observations on what takes place in the aquaponics system. Students will work in groups to discuss how the plants and animals work together in the aquaponics system to keep each other alive. Teachers will remind students of the basic needs of both animals and plants during their discussion. Students will record their information in their STEM journal.<br><br>**Lesson 2:**<br>Students will draw and label in their STEM journals the parts of the aquaponics system. They can explain why it is important that the aquaponics system is located near the window according to the needs of plants and animals. | aquaponics lab. Students will generate questions about the system. Students will then observe the virtual aquaponics system.<br><br>**Lesson 2:**<br>The teacher will model different scenarios using the virtual tool. Students will record their observations about the changes in the system environment. Students will compare and contrast the different scenarios and identify what part of the system environment was changed by the plants and/or animals and why they think the change occured. Students will then work in small groups to construct an explanation about one of the ways the environment was changed and how the plants and animals | and ask questions to determine what is a rock or a mineral in the aquaponics system.<br><br>1) The students will ask questions to determine the attributes of some of the materials in the aquaponics system. They will write down their questions and share with the group.<br>2) The students will test some of the materials in the aquaponics systems to determine their physical attributes. | a food chain or food web using our aquaponics system<br><br>**Lesson 2:**<br>Have students group producers, consumers, and decomposers from our aquaponics system.<br><br>**Lesson 3:**<br>Have students explain the flow of energy within our aquaponics system by either acting out the flow of energy or develop a model to explain the flow of energy. | students will classify the organisms they see in the aquaponics system. Students will identify the plant and animals and use observational data to justify their reasoning. Students explain if they think the plant is vascular or nonvascular, and explain how they know. Students will classify the animal as vertebrate or invertebrate, and be able to justify their reasoning.<br><br>**Lesson 2:**<br>In small groups or with partners students can make a model of the organisms in the aquaponics system and how they would classify them. For the plant side of the model, students would determine if the plant was vascular or nonvascular, seeded, spores, or non-seeded, etc. This is a model |

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| | answer each team will report the answer to the group. Then the questions will be posted in 4 corners and students must go to the corner that they think has the most interesting question/the most important question etc.and explain their thoughts. | **Lesson 3:**<br>Students will work together to discuss the different tools used to collect data on the aquaponic system. | caused that change. Students can then present their explanations to the class. | | | that they will continually revise as they are learning more about the aquaponics system and classification of organisms. Later in the year, students can add other organisms like bacteria, or algae to the model as they extend their knowledge throughout the school year.<br><br>**Lesson 3:**<br>Students will research different plants that might thrive in the aquaponics and classify those plants. Students will then share what they found with the class. As a class those plants can be classified by categories, vascular, non-vascular, seeded, spores, non-seeded, and observations can be made to determine the type of plants that would thrive in an aquaponics |

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6) Submit this document (one per group) to the Google Form on the Google Site.